C L A I M S

1. A negative electrode for a rechargeable lithium battery which includes a conductive metal foil current collector and an active material layer provided on a surface of the current collector and comprising a binder and particles of active material containing silicon and/or a silicon alloy;

said negative electrode characterized in that said binder has mechanical properties of at least 50 N/mm^2 tensile strength, at least 10 % elongation at break, at least 2.5×10^{-3} J/mm^3 strain energy density and up to 10,000 N/mm^2 elastic modulus.

2. A negative electrode for a rechargeable lithium battery which includes a conductive metal foil current collector and an active material layer provided on a surface of the current collector and comprising a binder and particles of active material containing silicon and/or a silicon alloy;

said negative electrode characterized in that said current collector has mechanical properties of at least 80 N/mm^2 tensile strength, at least 30 N/mm^2 proportional limit, at least 1.0 % elongation at break and at least 0.03 % elastic elongation limit and said binder has mechanical properties of at least 50 N/mm^2 tensile strength, at least 10 % elongation at break, at least 2.5×10^{-3} J/mm^3 strain energy density and up to 10,000 N/mm^2 elastic modulus.

3. The negative electrode for a rechargeable lithium battery

as recited in claim 2, characterized in that said negative electrode is obtained by providing said active material layer on the surface of said current collector and then carrying out a sintering treatment, and that said mechanical properties are imparted to the current collector by a thermal history of the sintering treatment.

4. The negative electrode for a rechargeable lithium battery as recited in claim 2, characterized in that said mechanical properties are imparted to said current collector by subjecting the current collector to a heat treatment before said active material layer is provided on the surface of the current collector.

5. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 4, characterized in that a thickness X of said active material layer, a thickness Y and a surface roughness Ra of said current collector satisfy the relationships $5Y \geq X$ and $250Ra \geq X$.

6. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 5, characterized in that said surface of the current collector that carries the active material layer thereon has a surface roughness Ra of at least 0.2 μm.

7. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 6, characterized in that said current collector comprises a copper foil, a copper alloy

foil or a metal foil having a copper or copper alloy surface layer.

8. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 7, characterized in that said current collector comprises an electrolytic copper foil, an electrolytic copper alloy foil or a metal foil having an electrolytic copper or copper alloy surface layer.

9. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 8, characterized in that said negative electrode is obtained by providing said active material layer on the surface of said current collector and then carrying out a sintering treatment, and that said binder has said mechanical properties after a thermal history of the sintering treatment.

10. The negative electrode for a rechargeable lithium battery as recited in claim 9, characterized in that said sintering treatment is carried out at a temperature higher than a glass transition temperature of said binder.

11. The negative electrode for a rechargeable lithium battery as recited in claim 9 or 10, characterized in that said sintering treatment is carried out at a temperature lower than a decomposition temperature of said binder.

12. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 8, characterized in that, after provision of said active material layer on the

surface of said current collector, a heat treatment is carried out at a temperature higher than a glass transition temperature of said binder to improve adhesion of the binder to the current collector.

13. The negative electrode for a rechargeable lithium battery as recited in claim 12, characterized in that said binder has said mechanical properties after a thermal history of said heat treatment.

14. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 13, characterized in that said binder has a linear expansion coefficient of 0.1 x 10^{-5} - 30 x 10^{-5} $℃^{-1}$.

15. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 14, characterized in that said binder has a glass transition temperature of up to 450 ℃.

16. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 15, characterized in that said binder is thermoplastic.

17. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 16, characterized in that said binder comprises polyimide.

18. The negative electrode for a rechargeable lithium battery as recited in claim 17, characterized in that said polyimide is thermoplastic.

19. The negative electrode for a rechargeable lithium battery as recited in claim 17, characterized in that said polyimide is produced as a result of a heat treatment of polyamic acid.

20. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 19, characterized in that said active material particles have a mean particle diameter of up to 10 μm.

21. The negative electrode for a rechargeable lithium battery as recited in any one of claims 1 - 20, characterized in that said active material layer includes a conductive powder.

22. A rechargeable lithium battery including the negative electrode as recited in any one of claims 1 – 21, a positive electrode containing a positive electrode material and a nonaqueous electrolyte.